

**S/N Unknown**

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant:	Leonard Forbes et al.	Examiner:	Ly D. Pham
Serial No.:	Unknown	Group Art Unit:	Unknown
Filed:	Herewith	Docket:	1303.024US2
Title:	INTEGRATED CIRCUIT MEMORY DEVICE AND METHOD		

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**INFORMATION DISCLOSURE STATEMENT**

Mail Stop Patent Application  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

In compliance with the duty imposed by 37 C.F.R. § 1.56, and in accordance with 37 C.F.R. §§ 1.97 *et. seq.*, the enclosed materials are brought to the attention of the Examiner for consideration in connection with the above-identified patent application. Applicants respectfully request that this Information Disclosure Statement be entered and the documents listed on the attached Form 1449 be considered by the Examiner and made of record. Pursuant to the provisions of MPEP 609, Applicants request that a copy of the 1449 form, initialed as being considered by the Examiner, be returned to the Applicants with the next official communication.

Pursuant to 37 C.F.R. §1.97(b), it is believed that no fee or statement is required with the Information Disclosure Statement. However, if an Office Action on the merits has been mailed, the Commissioner is hereby authorized to charge the required fees to Deposit Account No. 19-0743 in order to have this Information Disclosure Statement considered.

Pursuant to 37 C.F.R. §1.98(d), copies of the listed documents are not provided as these references were previously cited by or submitted to the U.S. Patent Office in connection with Applicants' prior U.S. application, Serial No. 09/945498, filed on August 30, 2001, which is relied upon for an earlier filing date under 35 U.S.C. §120.

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The Examiner is invited to contact the Applicants' Representative at the below-listed telephone number if there are any questions regarding this communication.

Respectfully submitted,

LEONARD FORBES ET AL.

By their Representatives,

SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.

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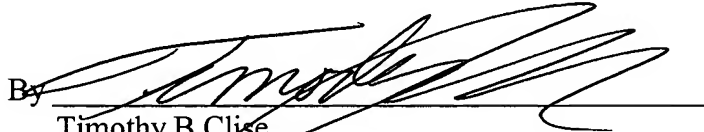
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STATEMENT BY APPLICANT**

(Use as many sheets as necessary)

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<b>Application Number</b>	Unknown
<b>Filing Date</b>	Even Date Herewith
<b>First Named Inventor</b>	Forbes, Leonard
<b>Group Art Unit</b>	Unknown
<b>Examiner Name</b>	Pham, Ly

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**US PATENT DOCUMENTS**

Examiner Initial *	USP Document Number	Publication Date	Name of Patentee or Applicant of cited Document	Class	Subclass	Filing Date If Appropriate
	US-2001/0013621	08/16/2001	Nakazato, Kazuo	257	314	12/08/2000
	US-2002/0106536	08/08/2002	Lee, Jongho, et al.	428	702	02/02/2001
	US-2002/0137250	09/26/2002	Nguyen, B., et al.	438	53	03/15/2002
	US-4,295,150	10/13/1981	Adam, Fritz	357	54	10/01/1979
	US-4,412,902	11/01/1983	Michikami, Osamu, et al.	204	192	06/18/1982
	US-4,757,360	07/12/1988	Faraone, Lorenzo, et al.	357	23.5	07/06/1983
	US-4,780,424	10/25/1988	Holler, Mark A.	437	29	09/28/1987
	US-5,042,011	08/20/1991	Casper, Stephen L., et al.	365	205	05/22/1989
	US-5,071,782	12/10/1991	Mori, Kiyoshi	437	48	06/28/1990
	US-5,073,519	12/01/1991	Rodder, Mark	438	269	10/31/1990
	US-5,280,205	06/18/1994	Green, Robert S., et al.	307	530	04/16/1992
	US-5,350,738	09/27/1994	Hase, Takashi, et al.	505	473	11/27/1992
	US-5,399,516	03/21/1995	Bergendahl, A., et al.	437	43	09/21/1992
	US-5,418,389	05/23/1995	Watanabe, Y.	257	295	11/09/1993
	US-5,497,494	03/05/1996	Combs, J., et al.	395	750	07/23/1993
	US-5,498,558	03/12/1996	Kapoor, A	437	43	05/06/1994
	US-5,508,544	04/16/1996	Shah, P. L.	257	316	09/27/1994
	US-5,600,592	02/04/1997	Atsumi, S., et al.	365	185.18	05/08/1995
	US-5,618,575	04/08/1997	Peter, Gunter	427	8	04/21/1995
	US-5,627,785	05/06/1997	Gilliam, Gary R., et al.	365	189.01	03/15/1996
	US-5,677,867	10/14/1997	Hazani, E.	365	185	06/30/1995
	US-5,691,230	11/25/1997	Forbes, Leonard	437	62	09/04/1996
	US-5,801,401	09/01/1998	Forbes, Leonard	257	77	01/29/1997
	US-5,852,306	12/22/1998	Forbes, Leonard	257	315	01/29/1997
	US-5,880,991	03/09/1999	Hsu, L., et al.	365	182	04/14/1997
	US-5,923,056	07/13/1999	Lee, Woo-Hyeong, et al.	257	192	03/12/1998
	US-5,936,274	08/10/1999	Forbes, Leonard, et al.	257	315	07/08/1997
	US-5,981,350	11/09/1999	Geusic, Joseph E., et al.	438	386	05/29/1998
	US-5,986,932	11/16/1999	Ratnakumar, K. N., et al.	365	185.07	06/30/1997
	US-5,991,225	11/23/1999	Forbes, Leonard, et al.	365	230.06	02/27/1998
	US-6,025,228	02/15/2000	Ibok, E., et al.	438	261	11/25/1997
	US-6,025,627	02/15/2000	Forbes, Leonard, et al.	257	321	05/29/1998
	US-6,031,263	02/29/2000	Forbes, Leonard, et al.	257	315	07/29/1997
	US-6,069,380	05/30/2000	Chou, S. Y., et al.	257	315	07/25/1997
	US-6,069,816	05/30/2000	Nishimura, Kiyoshi	365	145	11/24/1998
	US-6,124,729	09/26/2000	Noble, Wendell P., et al.	326	41	02/27/1998
	US-6,134,175	10/17/2000	Forbes, Leonard, et al.	365	230.06	08/04/1998

**EXAMINER****DATE CONSIDERED**

Substitute Disclosure Statement Form (PTO-1449)

\* EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 809. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional) 2 Applicant is to place a check mark here if English language Translation is attached

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**INFORMATION DISCLOSURE  
STATEMENT BY APPLICANT**  
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<b>First Named Inventor</b>	Forbes, Leonard
<b>Group Art Unit</b>	Unknown
<b>Examiner Name</b>	Pham, Ly

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	US-6,135,175	10/24/2000	Gaudreault, P., et al.	144	4.1	10/19/1998
	US-6,141,238	10/31/2000	Forbes, L., et al.	365	145	08/30/1999
	US-6,141,248	10/31/2000	Forbes, L., et al.	365	185.08	07/29/1999
	US-6,143,636	11/07/2000	Forbes, Leonard, et al.	438	587	08/20/1998
	US-6,153,468	11/28/2000	Forbes, Leonard, et al.	438	257	05/17/1999
	US-6,163,049	12/19/2000	Bui, N. D.	257	321	10/13/1998
	US-6,208,164	03/27/2001	Noble, Wendell P., et al.	326	41	08/04/1998
	US-6,210,999	04/03/2001	Gardner, Mark I., et al.	438	183	12/04/1998
	US-6,229,175	05/08/2001	Uchida, Hidetsugu	257	315	03/19/1999
	US-6,238,976	05/29/2001	Noble, Wendell P., et al.	438	259	02/27/1998
	US-6,246,606	06/12/2001	Forbes, Leonard, et al.	365	185.03	09/02/1999
	US-6,249,020	06/19/2001	Forbes, Leonard, et al.	257	315	08/27/1998
	US-6,249,460	06/19/2001	Forbes, Leonard, et al.	365	185.28	02/28/2000
	US-6,307,775	10/23/2001	Forbes, Leonard, et al.	365	185.01	08/27/1998
	US-6,323,844	11/27/2001	Yeh, Fu-Kuo, et al.	345	166	08/11/1997
	US-6,351,411	02/26/2002	Forbes, Leonard, et al.	365	182	06/12/2001
	US-6,424,001	07/23/2002	Forbes, Leonard, et al.	257	315	02/09/2001
	US-6,461,931	10/08/2002	Eldridge, Jerome M.	438	398	08/29/2000
	US-6,541,280	04/01/2003	Kaushik, Vidya S., et al.	438	3	03/20/2001
	US-6,586,797	07/01/2003	Forbes, Leonard, et al.	257	325	08/30/2001

**FOREIGN PATENT DOCUMENTS**

Examiner Initials*	Foreign Document No	Publication Date	Name of Patentee or Applicant of cited Document	Class	Subclass	T <sup>2</sup>
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**OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS**

Examiner Initials*	Cite No <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>2</sup>
		AARIK, JAAN , et al., "Anomalous effect of temperature on atomic layer deposition of titanium oxide", <u>Journal of Crystal Growth</u> , (2000),pp. 531-537	
		AARIK, JAAN , et al., "Texture development in nanocrystalline hafnium dioxide thin films grown by atomic layer deposition", <u>Journal of Crystal Growth</u> , 220(1-2), (2000),105-113	
		AFANAS'EV, V , et al., "Electron energy barriers between (100)Si and ultrathin stacks of SiO2, Al2O3, and ZrO3 and ZrO2 insulators", <u>Applied Physics Letters</u> , 78(20), (2001),pp. 3073-3075	
		ARYA, S. , et al., "Conduction Properties of Thin Al2O3 Films", <u>Thin Solid Films</u> , 91, (1982),363-374	
		DIPERT, BRIAN , "Flash Memory Goes Mainstream", <u>IEEE Spectrum</u> , 30(10), (October 1993),48-52	
		EIERDAL, L. , et al., "Interaction of oxygen with Ni(110) studied by scanning tunneling microscopy", <u>Surface Science</u> , 312, (1994),pp. 31-53	

EXAMINER

DATE CONSIDERED

Substitute for form 1449A/PTO <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> <i>(Use as many sheets as necessary)</i>	<i>Complete if Known</i>	
	<b>Application Number</b>	Unknown
	<b>Filing Date</b>	Even Date Herewith
	<b>First Named Inventor</b>	Forbes, Leonard
	<b>Group Art Unit</b>	Unknown
	<b>Examiner Name</b>	Pham, Ly
Sheet 3 of 5	Attorney Docket No: 1303.024US2	

OTHER DOCUMENTS -- NON PATENT LITERATURE DOCUMENTS			
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		ELDRIDGE, J. , et al., "Analysis of Ultrathin Oxide Growth on Indium", <u>Thin Solid Films</u> , 12, (1972),pp. 447-451	
		ELDRIDGE, J. , et al., "Measurement of Tunnel Current Density in a Metal-Oxide-Metal System as a Function of Oxide Thickness", <u>Proc. 12th Intern. Conf. on Low Temperature Physics</u> , (1971),427-428	
		ELDRIDGE, J.M. , et al., "The Growth of Thin PbO Layers on Lead Films", <u>Surface Science</u> Vol. 40, (1973),512-530	
		FERGUSON, J D., et al., "Atomic layer deposition of Al <sub>2</sub> O <sub>3</sub> and SiO <sub>2</sub> on BN particles using sequential surface reaction", <u>Applied Surface Science</u> , (2000),pp. 280-292	
		GREINER, J. , "Josephson Tunneling Barriers by rf Sputter Etching in an Oxygen Plasma", <u>Journal of Applied Physics</u> , 42(12), (November 1971),5151-5155	
		GREINER, J. , "Oxidation of lead films by rf sputter etching in an oxygen plasma", <u>Journal of Applied Physics</u> , 45(1), (1974),32-37	
		GRIMBOLT, J. , "I. Interaction of Al Films with O <sub>2</sub> at Low Pressures", <u>Journal of the Electrochemical Society</u> , 129(10), (1982),pp. 2366-2368	
		GRIMBOLT, J. , "II. Oxidation of Al Films", <u>Journal of Electrochem Soc.: Solid-State Science and Technology</u> , (1982),pp. 2369-2372	
		GUNDLACH, K. , et al., "Logarithmic Conductivity of Al-Al <sub>2</sub> O <sub>3</sub> -Al Tunneling Junctions Produced by Plasma and by Thermal Oxidation", <u>Surface Science</u> , 27, (1971),125-141	
		GUO, X. , "High Quality Ultra-thin (1.5 nm) TiO <sub>2</sub> /Si <sub>3</sub> N <sub>4</sub> Gate Dielectric for Deep Sub-micron CMOS Technology", <u>IEDM Technical Digest</u> , (1999),pp. 137-140	
		HODGES, D. A., <u>Analysis and Design of Digital Integrated Circuits</u> , 2nd Edition, McGraw-Hill Publishing. New York,(1988),pp. 354-357, 394-396	
		HURYCH, Z. , "Influence of Non-Uniform Thickness of Dielectric Layers on Capacitance and Tunnel Currents", <u>Solid-State Electronics</u> , vol. 9, (1966),967-979	
		ITOKAWA, H , "Determination of Bandgap and Energy Band Alignment for High-Dielectric-Constant Gate Insulators Using High-Resolution X-ray Photoelectron Spectroscopy", <u>Extended Abstracts of the 1999 International Conference on Solid State Devices and Materials</u> , (1999),pp. 158-159	
		KIM, YONG S., et al., "Effect of rapid thermal annealing on the structure and the electrical properties of atomic-layer-deposited Ta <sub>2</sub> O <sub>5</sub> films", <u>Journal of the Korean Physical Society</u> , (December 2000),pp. 975-979	
		KIM, H. , "Leakage current and electrical breakdown in metal-organic chemical vapor deposited TiO <sub>2</sub> dielectrics on silicon substrates", <u>Applied Phys. Lett.</u> , 69(25), (1996),pp. 3860-3862	
		KIM, YEONG K., et al., "Novel capacitor technology for high density stand-alone and embedded DRAMs", <u>IEDM</u> , (2000),pp. 369-372	
		KUBASCHEWSKI, O. , et al., <u>Oxidation of Metals and Alloys</u> , Second Edition, Butterworths, London,(1962),pp. 1-3, 5,6, 8-12, 24, 36-39, 53-63	

EXAMINER

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		KUKLI, KAUPO , "Atomic Layer Deposition of Titanium Oxide from TiI4 and H2O2", <u>Chemical Vapor Deposition</u> , 6(6), (2000),303-310	
		KUKLI, KAUPO , et al., "Atomic layer deposition of zirconium oxide from zirconium tetraiodide, water and hydrogen peroxide", <u>Journal of Crystal Growth</u> , (2001),pp. 262-272	
		KUKLI, K. , "Development of Dielectric Properties of Niobium Oxide, Tantalum Oxide, and Aluminum Oxide Based Nanolayered Materials", <u>Journal of the Electrochemical Society</u> , 148(2), (2001),pp. F35-F41	
		KUKLI, KAUPO , et al., "Real-time monitoring in atomic layer deposition of TiO2 from TiI4and H2O-H2O2", <u>American Chemical Society</u> , (2000),pp. 8122-8128	
		KWO, J. , "Properties of high k gate dielectrics Gd2O3 and Y2O3 for Si", <u>Journal of Applied Physics</u> , 89(7), (2001),pp. 3920-3927	
		LEE, J. , et al., "Effect of Polysilicon Gate on the Flatband Voltage Shift and Mobility Degradation for ALD-Al2O3 Gate Dielectric", <u>IEDM</u> , (2000),pp. 645-648	
		LUAN, H. F., "High Quality Ta2O5 Gate Dielectrics with Tox,eq<10A", <u>IEDM Technical Digest. International Electron Devices Meeting</u> , (December 5-8, 1999),141-143	
		MA, Y. , et al., "Zirconium Oxide Based Gate Dielectrics with equivalents Oxide Thickness of LESS Than 1.0 nm and Performance of Submicron MOSFET using a Nitride Gate Replacement Process", <u>IEDM - Technical Digest</u> , (1999),pp. 149-152	
		MARSHALEK, R. , et al., "Photoresponse Characteristics of Thin-Film Nickel-Nickel Oxide-Nickel Tunneling Junctions", <u>IEEE Journal of Quantum Electronics</u> , QE-19(4), (1983),pp. 743-754	
		MASUOKA, F. , et al., "A 256K Flash EEPROM using Triple Polysilicon Technology", <u>IEEE International Solid-State Circuits Conference, Digest of Technical Papers</u> , (1985),168-169	
		MASUOKA, F. , et al., "A New Flash EEPROM Cell using Triple Polysilicon Technology", <u>International Electron Devices Meeting, Technical Digest</u> , San Francisco, CA,(1984),464-467	
		MORI, S. , et al., "Reliable CVD Inter-Poly Dielectrics for Advanced E&EEPROM", <u>Symposium on VLSI Technology, Digest of Technical Papers</u> , (1985),16-17	
		MULLER, H. , "Electrical and Optical Properties of Sputtered In2O3 Films", <u>Physica Status Solidi</u> , 27(2), (1968),pp.723-731	
		PARANJPE, AJIT , et al., "Atomic layer deposition of AlOx for thin film head gap applications", <u>Journal of the Electrochemical Society</u> , (September 2001),pp. 465-471	
		PASHLEY, R. , et al., "Flash Memories: the best of two worlds", <u>IEEE Spectrum</u> , 26(12), (December 1989),30-33	
		POLLACK, S. , et al., "Tunneling Through Gaseous Oxidized Films of Al2O3", <u>Transactions of the Metallurgical Society of AIME</u> , 233, (1965),497-501	

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		QI, W , "MOSCAP and MOSFET characteristics using ZrO2 gate dielectric deposited directly on Si", <u>IEDM - Technical Digest</u> , (1999),145-148	
		ROBERTSON, J. , "Band offsets of wide-band-gap oxides and implications for future electronic devices", <u>Journal of Vacuum Science &amp; Technology B (Microelectronics and Nanometer Structures)</u> , 18(3), (May-June 2000),1785-1791	
		ROBERTSON, J. , "Schottky barrier heights of tantalum oxide, barium strontium-titanate, lead titanate, and strontium bismuth tantalate", <u>Applied Physics Letters</u> , 74(8), (1999),pp. 1168-1170	
		SHI, Y. , "Tunneling Leakage Current in Ultrathin (<4 nm) Nitride/Oxide Stack Dielectrics", <u>IEEE Electron Device Letters</u> , 19(10), (Oct. 1998),pp. 388-390	
		SIMMONS, J. , "Generalized Formula for the Electric Tunnel Effect between Similiar Electrodes Separated by a Thin Insulating Film", <u>Journal of Applied Physics</u> , 34(6), (1963),1793-1803	
		SMITH, RYAN C., et al., "Chemical vapour deposition of the oxides of titanium, zirconium and hafnium for use as high-k materials in microelectronic devices. A carbon-free precursor for the synthesis if hafnium dioxide", <u>Advanced Materials for Optics and Electronics</u> , (2000),pp. 105-106	
		SWALIN, R. , "Equilibrium between Phases of Variable Composition", <u>Thermodynamics of Solids, 2nd Edition</u> , (1972),pp. 165-180	
		SZE, S. , "Physics of Semiconductor Devices, Second Edition", <u>John Wiley &amp; Sons, New York</u> , (1981),553-556	
		YAN, J. , et al., "Structural and electrical characterization of TiO2 grown from titanium tetrakis-isopropoxide (TTIP) and TTIP/H2O ambients", <u>Journal Vac. Sci. Technol. B</u> , 14(3), (1996),pp. 1706-1711	
		ZHANG, H. , et al., "Atomic Layer Deposition of High Dielectric Constant Nanolaminates", <u>Journal of The Electrochemical Society</u> , 148(4),(2001),F63-F66	

EXAMINER

DATE CONSIDERED